

CLAIMS

1. A handrail driving system (2) for a handrail (1), e.g. an escalator (4) or a people-mover, with at least one driving element (10) actively connected with a driving motor (12) and formed for contacting the driving element (10) by areas, characterized in that at least within a contact area (13) formed for contacting the handrail (1), the driving element (10) is made from a material forming in said contact area (13) through interaction with the material of the handrail a pairing having a friction coefficient of higher than or equal to 0.95.
2. The handrail driving system according to claim 1, characterized in that the driving element (10) is formed by a driving wheel (14).
3. The handrail driving system according to claim 1 or 2, characterized in that the driving wheel (14) is realized in the form of a gummed metal wheel or solid-rubber tire.
4. The handrail driving system according to any one of the preceding claims, characterized in that the driving wheel (14) is formed by a preferably expandable friction body (67) arranged on a wheel hub (66) particularly in the form of a fillable hollow body (70) such as, e.g. an air-filled tire preferably consisting of rubber.
5. The handrail driving system according to any one of the preceding claims, characterized in that at least in the contact area (13), a contact surface (16) of the driving element (10) has a fiber-like structure, particularly a microfiber structure.
6. The handrail driving system according to any one of the preceding claims, characterized in that at least in the contact area (13), the driving element (10) has a one-component or multi-component outer shell formed by said material, particularly a bearing socket or bearing sleeve.
7. The handrail driving system according to any one of the preceding claims, characterized in that the driving element (10) has a width (87) at least approximately as large as the width of the lower belt (60) of the handrail (1) in the contact area (13).

8. The handrail driving system according to any one of the preceding claims, characterized in that the material of the driving element (10) is formed, or the air pressure in the air-filled tire rated in the contact area (13) in such a way that the driving element (10) at least approximately rests flatly on the handrail (1).
9. The handrail driving system according to any one of the preceding claims, characterized in that the driving element (10) is arranged in a lower area (51) of the handrail (1) for forming the contact area (13).
10. The handrail driving system according to any one of the preceding claims, characterized in that at least one driving wheel (14) is arranged in one of the lateral areas (40, 41) of the handrail (1) for forming the contact area (13).
11. The handrail driving system according to any one of the preceding claims, characterized in that one or more driving elements (10) are arranged in series, if necessary, in each of the lateral areas (40, 41) of the handrail (1) opposing one another.
12. The handrail driving system according to any one of the preceding claims, characterized in that several driving wheels (14) are combined to form a caterpillar drive.
13. The handrail driving system according to any one of the preceding claims, characterized in that the at least one driving element (10) is formed in areas for positively interacting with the handrail (1).
14. The handrail driving system according to any one of the preceding claims, characterized in that the contact areas (16) formed on the driving wheel (14) limit, e.g. a cone-shaped recess (81) on the outer revolving surface (82) of the driving wheel (14); and that the contact areas (16) on a driving wheel (14) formed as a type of bevel gear extend slanted relative to the axis of revolution (65) of the driving wheel (14).
15. The handrail driving system according to any one of the preceding claims, characterized in that on its external revolving surface (82), the driving wheel (14) has an elevation with the contact surface (16) formed thereon.

16. A handrail guiding system (8) for a handrail (1), e.g. of an escalator (4) of people-mover, with at least one guiding element (29) formed in areas for contacting a handrail (1), characterized in that at least in the contact area (34) formed for contacting the handrail (1), the guiding element (29) is realized by a material forming in said contact area (13) jointly with the material of the handrail a material pairing having a sliding friction coefficient of lower than or equal to 0.3.

17. The handrail guiding system according to claim 16, characterized in that at least in the contact area, the material of the guiding element (29) is selected from the group of polymers, particularly a plastic resistant to wear.

18. The handrail guiding system according to claim 16 or 17, characterized in that at least in the contact area, the guiding element (29) of the handrail (1) is formed by a woven or knitted fabric consisting of, for example textile, synthetic fiber or ceramic materials, or mixtures thereof.

19. The handrail guiding system according to any one of claims 16 to 18, characterized in that the area of the guiding element (29) formed for contacting the handrail (1) is formed for positively engaging the handrail (1) particularly in recesses (43, 44) of said handrail (1).

20. The handrail guiding system according to claims 16 to 19, characterized in that at least in an area interacting with the handrail (1), the guiding element (29) has a substantially L-shaped cross-section, and/or the guiding element (29) is realized in the form of a U-shaped guiding rail (27, 28).

21. A handrail (1) for an escalator or people-mover, characterized in that at least in a contact area (13) formed for contacting a driving element (10) in the installed position of the handrail, the handrail (1) is formed by a material forming in said contact area (13) a material pairing interacting with the material of the driving element (10), said pairing having a static coefficient of friction of higher than or equal to 0.95, and/ or that the handrail (1) is formed by an upper belt (50) and a lower belt (52) connected by a connecting bridge (59), whereby the connecting bridge (59) has a smaller cross-sectional width than the upper belt (50) and the lower belt (52), and whereby the upper belt (50) has covering extensions

(55, 56) in its lateral areas (40, 41), said covering extensions being bent at least in areas at least approximately in the direction of the lower belt (52) in order to cover the connecting bridge laterally at least by sections.

22. The handrail according to claim 21, characterized in that a contact surface (15) is formed on the bottom side of the handrail (1) for contacting the driving element (10) in the contact area (13), said contact surface preferably extending perpendicularly to a vertical center plane (57) of the handrail (1).

23. The handrail according to claim 21 or 22, characterized in that the contact surface (15) extends over 50% to 100%, particularly about 75% to 90% of the width of the handrail, particularly the width (60) of the lower belt.

24. The handrail according to any one of claims 21 to 23, characterized in that in a further contact area (34) formed for contacting a guiding element (29) of a handrail guiding system (8), the handrail (1) has a sliding surface (33), particularly a sliding layer (30).

25. The handrail according to claim 24, characterized in that in cooperation with a guiding element (29), the sliding surface (33) forms a pairing with a low coefficient of sliding friction amounting to between 0.1 and 0.5, particularly to lower than or equal to 0.3, e.g. 0.15 to 0.25.

26. The handrail according to any one of claims 21 to 25, characterized in that the handrail surface (21) is formed in the different contact areas (35, 36) for driving and guiding elements (10; 29) consisting of the same material as the handrail; however, said contact areas having different surface roughness conditions, particularly depths of roughness.

27. The handrail according to any one of claims 21 to 26, characterized in that the handrail (1) has at least one recess (43, 44), and that the limiting surface of the recess (43, 44) is preferably formed by the sliding surface (33).

28. The handrail according to claim 27, characterized in that the recess (43, 44) is realized in at least one lateral area (40, 41) of the handrail (1) in the form of a groove prefera-

bly having a substantially U-shaped or V-shaped peripheral contour.

29. The handrail according to any one of claims 21 to 28, characterized in that the handrail (1) is formed by an upper belt (50) and a lower belt (52) joined by a connecting bridge (59).

30. The handrail according to claim 29, characterized in that a gripping surface (54) for people is formed on the upper belt (50) over a part area of the surface (21) of the handrail.

31. The handrail according to claim 29 or 30, characterized in that in its lateral areas (40, 41), the upper belt (50) has covering extensions (55, 56) preferably for hiding a handrail guiding system (8) and a handrail driving system (2).

32. The handrail according to any one of claims 29 to 31, characterized in that the lower belt (52) of the handrail (1) is actively connected with the handrail driving system (2) and/or the handrail guiding system (8).

33. The handrail according to any one of claims 29 to 32, characterized in that at least one basic body (37) of the handrail comprising the upper belt (50), lower belt (52) and the connecting bridge (59) of the handrail (1), is realized in the form of one single piece consisting of a homogeneous material.

34. The handrail according to any one of claims 29 to 33, characterized in that the connecting bridge (59) extends between recesses (43, 44) formed in the lateral areas (40, 41) of the handrail (1), said recesses opposing each other.

35. The handrail according to any one of claims 29 to 34, characterized in that the width (58) of the connecting bridge (59) amounts to about 50% to 95%, particularly 75% to 85% of the width (60) of the lower belt of the handrail (1).

36. The handrail according to any one of claims 29 to 35, characterized in that the height of the connecting bridge (59) amounts to about 5% to 50%, particularly 10% to 20% of the height of the handrail.

37. The handrail according to any one of claims 21 to 36, characterized in that reinforcing elements such as, for example tension carriers (64) or reinforcing layers, e.g. of steel wire, steel sheet etc. are arranged in the basic body (37) of the handrail.

38. The handrail according to any one of claims 21 to 37, characterized in that the handrail (1) has its supporting profile cross-section (61) at least in the area of the connecting bridge (59), said cross-section of the profile having preferably a substantially rectangular or ellipsoidal shape.

39. The handrail according to claim 38, characterized in that the supporting profile cross-section (61) has a length-to-width ratio in the range of about 1:1 to 5:1, particularly of about 2:1.

40. The handrail according to claim 38 or 39, characterized in that the supporting profile cross-section (61) covers a surface area of from 50% to 95%, particularly 70% to 85% of the total cross-sectional surface area of the handrail (1).

41. The handrail according to any one of claims 21 to 40, characterized in that the bottom side of the lower belt (52) has a groove-like recess extending over the total length of the handrail, said recess being free of a sliding layer.

42. The handrail driving system and/or handrail according to at least one of claims 1 to 15 and/or 21 to 41, characterized in that at least one of the materials of the material pairing in the contact area (13) is selected from the group of elastomeric materials, particularly cross-linked elastomers, rubber, or thermoplastic elastomers.

43. The handrail driving system and/or handrail guiding system and/or handrail according to any one of the preceding claims, characterized in that the surface areas adjoining one another are profiled in at least one of the contact areas (13; 34) between the handrail (1) and the driving element (10) and/or between the handrail (1) and the guiding element (29).

44. The handrail guiding system and/or handrail according to any one of claims 16 to 20 and/or 21 to 41, characterized in that at least one of the surface areas (31, 32) of the

handrail (1) and/or guiding element (29) formed for mutually contacting each other, is formed by a further material or sliding layer (30), the latter being different from the material of the handrail (1) in or on the contact area (15).

45. The handrail guiding system and/or handrail according to claim 44, characterized in that the further material or sliding layer (30) is formed by a plastic, particularly a thermoplastic, a metal, or a metal alloy or a ceramic material.

46. The handrail guiding system and/or handrail according to claim 44 or 45, characterized in that the further material or sliding layer (30) is formed by a woven or knitted fabric consisting of textile, natural fiber, glass or plastic material, or mixtures thereof.

47. The handrail driving system and/or handrail guiding system and/or handrail according to at least one of the preceding claims, characterized in that in at least one of the contact areas (13; 34) between the handrail and the driving element (10), and/or between the handrail and the guiding element, at least one material of the material pairing is realized in the form of a separate sliding or friction layer, the latter being secured on the handrail (1) and/or on the driving element (10) and/or on the guiding element (29) particularly by material grip, e.g. adhesive gluing.

48. The handrail driving system and/or handrail guiding system and/or handrail according to at least one of the preceding claims, characterized in that in at least one of the contact areas (13; 34) between the handrail (1) and the driving element (10) and/or between the handrail (1) and the guiding element (29), at least one material of the material pairing formed is applied in the form of a coating (17).

49. The handrail driving system and/or handrail guiding system and/or handrail according to claim 47 or 48, characterized in that the coating (17) and/or the sliding or friction layer comprises at least one reinforcing layer (20).

50. The handrail driving system and/or handrail guiding system and/or handrail according to claim 49, characterized in that the reinforcing layer (20) is formed by a woven or knitted fabric.

51. An overall system preferably for application in conjunction with an escalator or people-mover, said overall system at least comprising a handrail (1) actively connected with a handrail driving system (2) and/or a handrail guiding system (8), characterized in that the handrail (1) is formed according to any one of claims 21 to 50, and/or the handrail driving system according to any one of claims 1 to 15, 42, 43, or 47 to 50, and/or the handrail guiding system (8) according to any one of claims 16 to 20 or 42 to 50.